



Critical Features of Science Education: A Comparison between Global and National Education Policy for Rohingya Refugee Children in Bangladesh

This paper was awarded first place in the second special issue of JRSMTTE on graduate research

Shukufe Rahman & Gayle Buck

Indiana University, USA



Abstract: Rohingya refugee children, a persecuted minority, should have the opportunity to acquire the level of scientific literacy necessary to survive and thrive in an increasingly scientific world. Unfortunately, our understanding of the role science education holds in the various educational policies that guide the programming for Rohingya refugee children in the camps in Bangladesh is minimal. The purpose of this study was to enhance that understanding. A vertical axes comparative case study approach was used to compare and analyze the policies at the global and national levels to elucidate the existing inclusion or lack of science and scientific literacy for the Rohingya refugee education system. Findings showed that the educational policies fall short in supporting and promoting science and scientific literacy along with numeracy and literacy. Based on evidence on comparison between global and national policies for education for Rohingya refugee children, this study led to the development of recommendations for enabling policies and inclusive science and scientific literacy can pave the path for a better future for the prosecuted Rohingya refugee children.

Keywords: *Comparative Case Study, Educational Policy, Refugee education, Rohingya Refugee, Science education, Scientific literacy, Vertical Axes.*

Introduction

The science education reform documents, *Science for All Americans* (AAAS, 1989) and *The National Science Education Standards* (National Research Council, 1996), hold as central the egalitarian belief that all children can learn science regardless of age, sex, cultural, or ethnic background, disabilities, aspirations, or interest and motivation in science (NRC, 1996). These initiatives not only encourage meeting the needs of ALL students in science education but also steer rethinking about what scientific knowledge and skills are relevant to all children. Scientific literacy is defined here as a form of scientific knowledge and skills which help individuals to sensibly deal with problems that often involve evidence, logical arguments, critical thinking, and communication in their lives, as well as issues with their surroundings (Roth & Lee, 2004). Scientific literacy plays a vital role in these science education reform agendas. Although not all students will become scientists, all will need to understand certain scientific concepts, hold some level of scientific attitudes, and demonstrate the necessary skills of analyzing information to make informed decisions in their everyday lives (Laugksch, 2000; Roth & Barton, 2004; Roth & Lee, 2004; Shen, 1975). Since science and technology have become an essential part of life in the 21st Century, attaining scientific literacy should be part of any primary education for any child, even if they are being educated in the world's most adverse living conditions. Following this, the Rohingya children in the camps in Bangladesh should have every opportunity to participate in science education and scientific literacy that will prepare them for a brighter future.

The Rohingya people of Myanmar are one of the world's largest groups of stateless people (Milton et al., 2017). Consequently, the Rohingya refugee crisis is one of the most significant ongoing humanitarian emergencies in recent history (Milton et al., 2017). To avoid conflict and persecution, Rohingya refugees have been fleeing Myanmar in large numbers to nearby countries, primarily Bangladesh. As of September 30, 2018, the population of Rohingya refugees in Bangladesh is 895,631, and 55% of this population is children (Karim & Hussain, 2019; Milton et al., 2017; Rahman & Missingham, 2018). The vast majority of Rohingya refugees reside in 34 extremely congested camps in the districts of Cox's Bazar in Bangladesh. The situation in the camps is precarious due to overcrowding, disease, lack of suitable shelter, safe drinking water, and prevailing weather conditions (Karim & Hussain, 2019; Milton et al., 2017; Rahman & Missingham, 2018; Shohel, 2022). Therefore, facilitating quality education in these circumstances is particularly challenging and limited (Milton et al., 2017; Shohel, 2022). Against this backdrop, the objective of this study was to analyze the international and national education policies guiding the science education practices that impact Rohingya refugee children in the specific context of camps in Bangladesh.

Theoretical Underpinning

Refugee Education

In this paper, "education" refers to the transmission of broad and specific knowledge that includes but goes beyond national education systems. Education is considered a fundamental human right for all and is closely linked to the future assurance of economic stability and better lives for children, families, and communities. Similarly, education was articulated as "a basic right" (Executive Committee of the high commissioner's Program, 200, p.6) and as an "enabling right," a right through which other rights were realized (UNHCR, 2011e, p.18) for refugee children in Article 22 of the 1951 Convention relating to the Status of Refugees. However, the right to education for refugees has been articulated in national and international policies (United Nations Universal Declaration of Human Rights, 1945; UNHCR 1951 convention), yet access to high-quality education that prepares refugee students for the future remains elusive.

Notably, education is critical for refugee children and youth affected by conflict since refugee children experience challenges related to social integration in new settings and ongoing challenges related to trauma exposure (S. Aydin et al., 2013; Bash & Zezlina-Phillips, 2006; Jain & Lee, 2017; Pinson & Arnot, 2010; Taylor & Sidhu, 2012). Additionally, most refugees must reside in temporary refugee camps in host countries where living conditions are deplorable, with inadequate food, shelter, education, and medical care. Therefore, refugee education in camps faces significant issues such as access to effective educational approaches, insufficient school infrastructure, poor teaching and learning resources, unqualified teachers, inadequate curriculum, funding problems, and refugee children's distress and trauma.

To provide quality education to refugee children in the camps in the host countries, the international policy (e.g., UNHCR Education Strategy, 2012-2016; New York Declaration, 2016; 2018 Global Compact and the 2019 UNHCR education strategy) advocates the host countries to increase learning opportunities, provide safe learning

environments, improve access to formal and informal education opportunities, ensure that educational opportunities are lifelong and available according to need for refugee children. However, unfortunately, the international policies for refugee education have come to be interpreted differently in different educational settings and their adaptation in multiple national contexts (Dryden-Peterson et al., 2019; Sinclair, 2001). Therefore, access to quality education for refugees becomes limited and uneven across regions and displacement settings (Dryden-Peterson, 2016a, 2017; Dryden-Peterson et al., 2019). At the same time, refugee education is generally of low quality in terms of three standards (teacher-student ratio, trained teachers, and certification) (Dryden-Peterson, 2016a). Moreover, UNHCR data showed high absenteeism and drop-out rates among refugee children and lower learning outcomes despite regular attendance (Dryden-Peterson, 2016a). Therefore, it is necessary to make refugee education meaningful and valuable to refugee children and societies.

Despite all these barriers, education is central to integrating and reestablishing refugee children in the future (Dryden-Peterson, 2017; Lee, 2013). It was and still is the primary avenue for refugees in enabling present and future durable solutions since education develops skills for future settlement, mitigates psychosocial distress, and protects vulnerable refugee children. For that reason, international and national policies for refugees prioritized education as one of the responses to refugee resettlement (Dryden-Peterson, 2016a; Dryden-Peterson et al., 2019; Menashy & Dryden-Peterson, 2015). However, the policy, as well as programs for refugee education, fell short of meeting the criteria for quality education since refugee education in camps or host countries emphasizes basic literacy, numeracy, and civic education (Kirk & Winthrop, 2007; Waters & LeBlanc, 2005) which was not directly linked to livelihoods in future. Moreover, the studies and reports, and policies for Refugee education indicated that refugee education in camps was more concentrated on meeting "psychosocial needs" than "educational needs," which somehow hindered the path of participation of refugee children in the modern future of society and the economy (Anderson et al., 2011; Aydin et al., 2019; Bash & Zezlina-Phillips, 2006; Dryden-Peterson, 2016b, 2017; Jain & Lee, 2017; Pinson & Arnot, 2010; Taylor & Sidhu, 2012).

Scientific Literacy

In support of science and science education, numerous aspects and perspectives were associated with science learning and its relevance to life. This paper highlighted one part of science and science education called "*Scientific Literacy*." Scientific literacy generally refers to the "public understanding of Science" (Roth & Barton, 2004; Roth & Lee, 2004). Scientific knowledge enables individuals to become involved in decision-making related to basic human needs (e.g., food, health, shelter) (Shen, 1975). As a result, a scientifically literate individual should be able to apply scientific knowledge and reasoning skills to solve problems and make decisions in their personal, civic, and professional life. Notably, scientific literacy was not limited to learning and teaching traditional key science concepts and principles in Physics, Chemistry, Biology, and so forth; it also included the development of specific skills, such as computational, manipulative, observation, communication, and critical response skills (Laugksch, 2000; Roth & Lee, 2004). With the help of scientific knowledge and skills, individuals can sensibly deal with problems that often involve evidence, logical arguments, critical thinking, communication in their lives, and issues with their surroundings. Scientific literacy is

beneficial for individual holistic development. However, the reasons refugee children need to be scientifically literate have yet to be explained. It has been widely accepted that having an improved understanding of science and technology is advantageous to anyone living in a science and technology-dominated society, specifically during this era of the 21st Century (Laugksch, 2000; Roth & Barton, 2004; Roth & Lee, 2004). Therefore, scientifically literate individuals will feel more comfortable and competent in dealing with daily matters. Moreover, individuals will be in a favorable position to secure job opportunities in the future since current knowledge of science, as well as specific scientific skills (problem-solving, critical thinking, logical argument, and communication) that we learned from being scientifically literate, were considered essential elements of what it means to be an educated person in 20th Century (Laugksch, 2000). This paper argued that any students, specifically refugee students, will understand scientifically and critique their own social, cultural, religious, linguistic, and economic positions and contexts as they learn science and participate in various science activities and skill development programs in formal or informal educational settings.

Scientific literacy is for all students, even those often discouraged from studying science, such as women, minorities, refugees, and immigrants (Roth & Barton, 2004; Roth & Lee, 2004). Scientific literacy leads to an entirely different image from the traditional nature of science practices and learning, where students are valued and empowered for their abilities to contribute to, critique, and partake in their society and community. Scientific literacy and science-related knowledge and activities would lead to positive formative experiences for refugee students who work to change their living conditions. It is clear and specific that in the case of refugee children, education should be more than numeracy and literacy to obtain employment in the future. However, while considering science education for refugee children, it should provide science concepts or understanding as science subjects and support their scientific literacy.

Methods

Methodological Approach

Given the purpose of analyzing the international and national education policies guiding the science education practices that impact Rohingya refugee children in the context of camps in Bangladesh, this study utilized the vertical axes of the Comparative Case Study by Bartlett & Vavrus (2017) from sociocultural perspectives. The Comparative Case Study is particularly well suited to social research about practice and policy, a recognized approach to understanding policy as a political process shaped and influenced by several actors and factors. This study sought to elucidate the movement of policy guiding the education of Rohingya refugee children from a global to a national level. The vertical axes comparative study requires researchers to pay attention to policy formation and implementation or appropriation across multiple sites (Bartlett & Vavrus, 2009; p2). Moreover, the Vertical Axes Comparative Study (VCS) examines the policies simultaneously in their global, national, and local dimensions. This approach offers the traditional common compare-and-contrast logic and evokes "tracing across" sites or scales. (Bartlett & Vavrus, 2017). The "tracing across" exemplifies researchers understanding of how the phenomenon/policy came into being, how different actors have appropriated it, and how it has been transformed in practice at different levels (Bartlett & Vavrus, 2017). By using this approach, this study only focused on the global and national policies for the education of the Rohingya refugee children in the camps in Bangladesh.

In the case of refugee education, the UN agencies and the global governors are the primary actors in policy-making and implementing refugee education. However, the host countries adopt the global policy recommendations to varying degrees that eventually determine the educational opportunities for the refugee children in the camps in that specific host country. Thus, the study adopted the VCS methodology to explain the interactions and connections of texts and policy vertically from the global to national for the education of Rohingya refugees in the camps in Bangladesh.

For the vertical comparison, this study purposefully chose global documents on refugee education and policy, which included the INEE Minimum Standards for education (2010), UNHCR's Education Strategy (2012), and UNHCR: the 1951 Refugee Convention (1952) for the global policy analysis. For analyzing the national policy for the Rohingya Refugee children in Bangladesh, the study went beyond the policy documents by the Bangladesh Government Rohingya Refugee Children. In the case of the refugee population, the policy problem is transboundary: they originate in one state but have ramifications for others. Thus, the main actors in carrying out policy formation and implementation for the refugee context are the international organizations (IOs) and transnational policy communities such as INEE (Jakobi, 2009; Srmp & Kamal, 2019). Along with the international organizations, transnational policy communities and other influential policymakers within NGOs and civil society are also other significant players noted in the context of policy for the refugee context. Global policy and actors are essential in this refugee context because they are most effective and can influence national policies and jurisdictions (Bauman & Miller, n.d.; Milner, 2014).

Although the global policy affects the national policy for education in the refugee context, there are various mechanisms by which the global policy is translated and implemented into action at a national level or local level. Since the trajectories of refugees do not fit neatly into the established and traditional policy of education, they are full of uncertainties (Dryden-Peterson, 2016a). Thus the educational policy and programs is considered highly politicized and emotive issue for all actors in multilateral organizations (host government, refugee communities, and International Organizations (IOs) involved in global and national policy for refugee education to make decisions (Dryden-Peterson et al., 2019). Several actors and educational programs are involved at different levels in adopting and composing a curriculum for refugee children in a particular context. For that reason, this study deliberately reviewed the reports, newsletter articles, publications, working and conference papers, government documents, and agency documents. To explore dissonances in the national educational policies for the displaced Rohingya children living in refugee camps in Bangladesh, the relevant keywords, i.e., 'Rohingya Refugee,' 'Rohingya Children,' 'Education,' and 'Bangladesh' were used for searching the existing literature. We used search engines such "google scholar," "Social Science Research Network" and "Research Gate" and databases (ERIC, Proquest, Academic Search, Education Full Text) to collect both academic and non-academic published and unpublished documents written in English. Finally, selected literature was explored to analyze how global and national policy influenced and shaped the opportunities for science learning for the Rohingya Refugee children in the camps in Bangladesh.

Data Analysis

In this study, we used a variety of documents as our data sources. This document analysis as an analytical method has been used in this study to elicit meaning, gain understanding and develop empirical knowledge to understand critical features of the policy. Generally, documents contain text (words) and images that have been recorded without researchers' intervention. Often documents provide a range of data, for example, background, context, additional questions, a means of change and development, and verification of findings. Thus, document analysis involves an iterative process of skimming (superficial examination) and reading (thorough examination and interpretation (Bowen, 2009, p.52).

By focusing on the purpose of this study, the study obtained documents by downloading copies from different websites. The researchers searched and reviewed various documents relevant to Rohingya Refugee education. This included policy documents of global and national governments, newsletters, annual and special reports of International Organizations and aid agencies, and research articles. After a thorough, systematic review of the above documents, the data were compared to understand the sociocultural and political contexts in which the curriculums and policies were conceived and implemented and how science education or literacy was portrayed. The documentary data served to ground the research in the context of refugee education, policy, and curriculum. In this process, the researchers reviewed the documents' lines, phrases, sentences, and paragraph segments to identify and discover patterns in the curriculums and procedures across both global and national levels. After constant checking and rechecking the documents to scrutinize and compare data within data to organize the findings, ideas, and pinpoints across both curricula and policies at the global and national levels has been conducted to understand and examine science education in the existing refugee education for the Rohingya refugee children in the camps in Bangladesh.

Results

A Comparison between Global and National Education Policy for Rohingya Refugee Children

Unquestionably, the Rohingya refugee students will have science learning experiences in their education process like any other children in the world if the educational programs and policies include opportunities for refugee students to be scientifically literate and for future growth in science-related fields and the jobs market. Refugees' right to quality education has been articulated through multiple international and national policies and treaties, but there needs to be more acknowledgment of science learning within refugee education. So far, neither the global nor the national policy precisely for Rohingya children has addressed the inclusion of science education in the form of scientific literacy in refugee education in the camps in Bangladesh.

First, at the global level, the 1951 Refugee Convention and its 1967 Protocol were the critical legal documents that defined refugee status and guaranteed the right to education to refugee children. Apart from expanding the definition of a refugee, the 1967 Protocol of the 1951 convention obliged host countries to comply and ensure the right to education to refugees, which states "shall accord to refugees the same treatment as is accorded to nationals concerning

elementary education.....[and] treatment as favorable as possible... concerning education other than elementary education" (1967 Protocol, article 22). Thus, the right to education for all, including refugee children, has become the center point of education strategies of the main actors such as UN agencies (UNHCR, UNICEF), the Inter-Agency Network for Education in Emergencies (INEE), and non-governmental organizations (Dryden-Peterson, 2016a) in the humanitarian world. With time, the nature of the humanitarian crisis, and expectations for education, the global education policy has changed and been shaped by different approaches, such as humanitarian and developmental.

Until the UNHCR Education Strategy, 2012-2016, all other international policies and strategies, even their programming, conceptualized education as a way to "psychosocial recovery" or "protection place of children" for the refugee children (UNHCR, 2012, Dryden-Peterson, 2016a). Later, identifying the need to sustain education in humanitarian crisis, the UNHCR Education Strategy, 2012-2016, took a decidedly developmental educational approach, setting its priority as "access to quality education" and its vital principle of "integration of students within the national system." (UNHCR, 2012, 8). In the new strategy, a humanitarian approach persisted but aligned with the developmental process. Thus, this strategy advocated host countries to establish temporary learning spaces immediately with attention to "establishment to formal schooling, both through the integration of refugee students into national systems and support for certified, quality education in the home country curriculum, where appropriate and feasible." (UNHCR, 2012, 7).

Differently, like many other countries hosting the world's largest refugee populations, Bangladesh did not sign the 1951 Refugee Convention, perhaps more significantly, did not recognize a forcibly displaced Rohingya population as refugees. For that reason, Bangladesh is not legally obliged to provide necessities for Rohingya refugees (Hargrave & Barbelet, 2019; Milton et al., 2017; M. A. Prodip, 2017; M. Prodip & Garnett, 2019; Rahman & Missingham, 2018). Moreover, the Bangladesh government deliberately did not want to integrate the Rohingya people into their local society (Milton et al., 2017; M. Prodip & Garnett, 2019; Rahman & Missingham, 2018). Therefore, it established a national educational policy called Guidelines for Informal Education Program (GIEP) for Rohingya children in pursuit of its efforts to prevent them from enrolling in schools in local communities or taking national school examinations. Inside the camps, not only did the government not provide any formal and accredited education, but it was also barring help from UN humanitarian agencies and NGOs funded by international donors (Milton et al., 2017; Prodip & Garnett, 2019; Rahman & Missingham, 2018; Save the Children, 2019; UNHCR, 2019). In addition, the policy also banned using the Bangladeshi curriculum and language in those informal settings for the Rohingya refugee children (Milton et al., 2017; Prodip & Garnett, 2019; Rahman & Missingham, 2018; Save the Children, 2019; UNHCR, 2019). All these heavily influential constraints related to the Rohingya refugees in Bangladesh make education a distant dream and a controversial and complex issue to solve. Despite these constraints and educational-related affairs, we still argue in favor of a more nuanced approach to science education in the curriculum and policy for the Rohingya refugee in the camps in Bangladesh in this study.

However, there have been some incremental changes in national policy, but still, Bangladesh has taken significant interventions supporting refugees' informal education in the camps. Since 2018, the Bangladesh government supporting the UNHCR Education Strategy, 2012-2016, with some reservations, has provided some informal education and vocational training in educational settings, such as "Learning Centers" for the Rohingya children who fled to Bangladesh in 2017 (Milton et al., 2017; Prodip & Garnett, 2019; Rahman & Missingham, 2018; UNHCR, 2019). The Bangladeshi authorities, with the help of International Non-profit Organizations (INGO) and local non-profit organizations (NGO), established the Learning Competency Framework and Approach (LCFA) under the Guidelines for Informal Education Program (GIEP) policy to provide informal education for younger children (Milton et al., 2017; Prodip & Garnett, 2019; Shohel, 2020; Rahman & Missingham, 2018). Under GIEP policy, UNICEF created a curriculum following INEE standards from scratch for Rohingya refugee children, eventually contracting the British Council to provide English lessons and BRAC (Bangladesh Rural Advancement Committee), an international humanitarian NGO headquartered in Bangladesh, to provide Burmese language and mathematics lessons (Milton et al., 2017; Prodip & Garnett, 2019; Esveld, 2019). This curriculum was not accredited and includes "super basic" (Esveld, 2019) instruction and lesson plans – without specific learning goals. These were only lessons scrambled together with English, Burmese, math, and "life skills" that one teacher said involved "making students aware of different types of diseases or letting the kids play with some toys" (Esveld, 2019, p.8). It is a matter of notice that the curriculum only covered the first and second levels of education (for preschool and first-year primary) with basic psychosocial and recreational support activities (Esveld, 2019; Prodip & Garnett, 2019, UNHCR, 2019). Humanitarian groups, agencies, and actors involved in this process contended that the curriculum did not provide long-term solutions or quality education for future settlement (Human Right Watch, 2019; Prodip & Garnett, 2019). There was a significant gap in global and national policies and programs for Rohingya adolescents aged 12-18. Humanitarian agencies initiate small-scale skills development programs (e.g., UNICEF, UNHCR, Save the Children) in partnership with governments. These informal programs in Rohingya refugee camps were mainly focused on providing literacy, numeracy, some life skills, and vocational skills training (Milton et al., 2017; Prodip & Garnett, 2019; Shohel, 2020). At the same time, it is also evident that neither the GIEP policy statement nor the locally customized curriculum follows INEE standards for the Rohingya refugee children in the camps in Bangladesh indicates any science learning-teaching opportunities.

Although, in the beginning, the policy for the education of refugee children at the global level was a human rights-based approach and wanted to promote the optimum development of refugee children through education, providing trajectories for preparedness in the future. Furthermore, the informal education provided for Rohingya children in the camps in Bangladesh was viewed as a relief program for psychosocial support for the Rohingya children, who were affected by the conflict and displacement (Human right watch, 2019; Milton et al., 2017; Prodip & Garnett, 2019; UNHCR, 2019). However, this informal education needed to be accredited in national systems (Bangladesh or Myanmar) and provide scientific knowledge opportunities to cultivate skills for the 21st Century. Thus, the informal education acquired by Rohingya refugees in camps was limited to basic literacy and numeracy between ages 5 and 14, along with basic psychosocial and recreational activities (Prodip & Garnett, 2019; Human right Watch, 2019), and

it did not display ways of participating in science or scientific literacy. Moreover, we have yet to see any specific indication in the collection of the policy statement or programming promoting scientific knowledge and science-related skills in the learning centers for Rohingya children or the skill development program for Rohingya adolescents at global and national levels.

On the other hand, after the UNHCR Education strategy, 2012-2016, the Global Compact on Refugees (GCR) and the Comprehensive Refugee Response Framework (CRRF) rolled out by recognizing the longer time of exile of refugees in host countries (International Crisis Group, 2019; Human Right watch, 2020, UNHCR, 2019). The United Nations General Assembly affirmed the Global Compact on Refugees (GCR) and Comprehensive Refugee Response Framework (CRRF) on December 17, 2018, which was weighted toward local integration. As a result, both the CRRF and the GCR supported the idea that refugees should be included in the national education systems of host countries where possible and appropriate (Esveld, 2019; Hargrave & Barbelet, 2019). Currently, 11 of 14 countries allow refugees to learn their national curriculum and language, whereas Bangladesh only adopted the inclusion policy partially. The GCR has been applied in a limited manner in response to the Rohingya crisis and has yet to demonstrate its influence on national policy and practice (Esveld, 2019; Milton et al., 2017; Rahman & Missingham, 2018).

In response to the GCR, the Bangladesh government allowed the Myanmar curriculum to be integrated into the education policy for the Rohingya children in the camps. In January 2020, Bangladesh approved a "pilot" program to allow 10,000 children to study the formal Myanmar curriculum in refugee camps under the Joint Response Plan 2030 for the Rohingya Humanitarian Crisis by UNHCR and The World Bank (Save the Children, 2019; Human right watch, 2020; UNICEF, 2020; UHCR, 2020). This was a potentially significant positive first step in national policy. Due to this, first-time Rohingya refugee children can access accredited education in camps with Rohingya teachers up to Grade 9 in Bangladesh. Rohingya children will learn Burmese, English, mathematics, science, and social studies, with additional subjects introduced in this Myanmar curriculum. However, still, there is no public information as to whether Myanmar will accredit this education or Bangladesh will certify the students' progress in this curriculum (Human right watch, 2020; Karim, 2020; Sohel,2020; UNICEF, 2020; UHCR, 202). Therefore, an education in the Myanmar curriculum might not best meet the needs of Rohingya children if they are forced to remain in long-term exile in Bangladesh. Despite the inclusion of the Myanmar curriculum, there was no evidence in the GCR policy at both national and global levels about science-related programs for Rohingya children in Bangladesh. Neither this curriculum nor policy contribute to scientific literacy, so the territory of education and future employment for Rohingya children remains volatile.

Science and scientific literacy were hardly mentioned in both policies (the UNHCR Education Strategy, 2012-2016 & GCR) at global and national levels (GIEP, LCFA) for shaping education for Rohingya refugee children. Though the global policies stated competencies and knowledge that refugee children could use flexibly across contexts, they failed conceptually to link to both national policy and refugee education programming due to the need for the inclusion of science education and scientific literacy. Furthermore, it must propose new tools for supporting science education and

the required skills for long-term solutions and future empowerment. By comparing and analyzing national and global policies for Rohingya refugee education in Bangladesh, this study anticipated that both approaches articulated their goals as being oriented toward preparing refugees for the future (Burgha et al., 2021; Prodio & Garnett, 2019). Across all levels, they expressed different ways of perceiving possible futures: informal education, life skills programs, the Myanmar curriculum, and inclusion in national systems. What is the gap here in the assumptions of quality education? At a global level, the actors presumed that quality education could be served from inclusion, including access to a national curriculum, the language of instruction, learning numeracy and literacy, qualified teachers, and certification, but without science education and scientific literacy. Therefore, the global policy needed specific guidelines or strategic plans to include scientific knowledge and practice ranging from schools to vocational, informal, tertiary, or skills-based training.

Furthermore, we cannot refuse the importance of science education in the form of "scientific literacy" in refugee education policies, practices, curriculum, and other forms of educational intervention for the Rohingya refugee children in the camps in Bangladesh. Science education and scientific literacy will equip Rohingya refugee children to lead successful career pathways and grow into law-abiding, engaged, and good citizens for their communities and host communities, even without accredited education. Therefore, both the policy for education at global and national levels need to explicitly address and promote scientific literacy to strengthen twenty-first-century skills, including scientific knowledge, critical thinking, communication, collaboration, and creativity for all refugee children, including the Rohingya refugee children. These skills can all be gained only by including science education in policy and practices, which improves the quality and accessibility of refugee education, reduces the level of distress, and nurtures hope among displaced and refugee communities for an unknown future.

Discussions and Implication

In summary, this study revealed that the educational policies shaping Rohingya refugee education at both the global and national levels focus on basic literacy and numeracy rather than scientific literacy. Due to this, there are significant gaps in education that Rohingya refugee children receive in the camps in Bangladesh and the contemporary goals of science education. Knowing and participating in science education may not only enable this group of children to pursue science-related professions but also improve their social and cultural status by developing the contemporary skills and understandings necessary to make informed decisions, increase economic power in the future, and bring greater well-being to themselves and their communities. The Rohingya children in Bangladeshi camps need more support and tools from international and national actors to support the inclusion of science in their educational policy and practices.

The evidence from the comparison between global and national policies showed that educational policy and interventions failed to provide quality education in terms of scientific knowledge, scientific literacy, and skills for future preparedness for Rohingya refugee children whose lives have been uprooted by conflict and disaster. To educate Rohingya children in Bangladesh camps, both global and national actors involved in policy and educational programs

need to acknowledge the need and inclusion of science and scientific literacy in curricula and the education system. Therefore, a science education model or framework suitable for this group of children must be developed to foster students' learning of the skills above, knowledge of science, and motivation for science learning. In this regard, fieldwork is needed, conducted with education providers, teachers, parents, and Rohingya refugee students, to understand the existing process and practices to incorporate science education and scientific literacy in formal and informal education settings in the camps. A brief overview of science education for Rohingya children in the camps in Bangladesh can be created from the findings of this study, leading to further research that will help us understand the effectiveness of science education for Rohingya refugee children in Bangladesh.

This study enhanced our understanding of the role science education currently holds in the various educational policies that guide the programming for Rohingya refugee children in the camps in Bangladesh. Much more research is needed. Future research could examine 1) how science education can be structured to meet the needs of refugee children in the makeshift settlement in their unknown future, 2) how the inclusion of science education will impact the current teaching of Rohingya children in camps in Bangladesh, and 3) how science education can be added to the existing education system of Rohingya children in Bangladesh.

Conclusion

In conclusion, this study sought to understand better how science education is/is not being positioned to support Rohingya refugee children in building positive science identities and a bright future, which for some will be in science-related careers and for others will come from being scientifically literate in their community and society. Formal and informal science and scientific literacy are liberating since it allows individuals to participate in society's development and secure their future. Besides numeracy, literacy, and psychosocial support, science education will enable and engage the world's most marginalized population – Rohingya refugee students – to change their world with every act of resisting the oppressive rule of their community. Therefore, this study raised questions that can help to extend the importance of policy at both global and national levels to be partners in supporting Rohingya refugee children in the camps in Bangladesh to learn and be involved in science education and scientific literacy to give them a better future.

References

- A sustainable policy for Rohingya Refugees in Bangladesh.* (2019, December 27). <https://www.crisisgroup.org/asia/south-asia/bangladesh/303-sustainable-policy-rohingya-refugees-bangladesh>
- Anderson, A., Hyll-Larsen, P., & Hofmann, J. (2011). The Right to Education for Children in Emergencies. *Journal of International Humanitarian Legal Studies*, 2(1), 84–126. <https://doi.org/10.1163/187815211X586151>
- Aydin, H., Gundogdu, M., & Akgul, A. (2019). Integration of Syrian Refugees in Turkey: Understanding the Educators' Perception. *Journal of International Migration and Integration*, 20(4), 1029–1040. <https://doi.org/10.1007/s12134-018-0638-1>

- Aydin, S., Demirdögen, B., Muslu, N., & Hanuscin, D. L. (2013). Professional Journals as a Source of PCK for Teaching Nature of Science: An Examination of Articles Published in “The Science Teacher (TST) (an NSTA Journal),” 1995-2010. *Journal of Science Teacher Education*, 24(6), 977–997.
<https://proxyiub.uits.iu.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1038972&site=eds-live&scope=site>
- Bartlett, L., & Vavrus, F. (2009). Introduction Knowing, Comparatively. In *Critical Approaches to Comparative Education: Vertical Case Studies from Africa, Europe, the Middle East, and the Americas* (p. 18). Palgrave Macmillan US; Springer Nature eBooks. https://doi.org/10.1057/9780230101760_1
- Bash, L., & Zezlina-Phillips, E. (2006). Identity, boundary and schooling: Perspectives on the experiences and perceptions of refugee children. *Intercultural Education*, 17(1), 113–128.
<https://doi.org/10.1080/14675980500502123>
- Bauman, E., & Miller, S. D. (n.d.). *Comprehensive literature review of Global Public Policy: Creating a framework for understanding Global Refugee Policy*. 87, 41.
- Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>
- Dryden-Peterson, S. (2016a). Policies for Education in Conflict and Post-Conflict Reconstruction. In K. Mundy, A. Green, B. Lingard, & A. Verger (Eds.), *The Handbook of Global Education Policy* (pp. 189–205). John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781118468005.ch10>
- Dryden-Peterson, S. (2016b). Refugee Education: The Crossroads of Globalization. *Educational Researcher*, 45(9), 473–482. <https://doi.org/10.3102/0013189X16683398>
- Dryden-Peterson, S. (2017). Refugee education: Education for an unknowable future. *Curriculum Inquiry*, 47(1), 14–24. <https://doi.org/10.1080/03626784.2016.1255935>
- Dryden-Peterson, S., Adelman, E., Bellino, M. J., & Chopra, V. (2019). The Purposes of Refugee Education: Policy and Practice of Including Refugees in National Education Systems. *Sociology of Education*, 92(4), 346–366. <https://doi.org/10.1177/0038040719863054>
- Education Strategy 2010-2012*. (2019).
- Esveld, B. V. (2019). “Are We Not Human?” <https://www.hrw.org/report/2019/12/03/are-we-not-human/denial-education-rohingya-refugee-children-bangladesh>
- Esveld, B. V. (2020, January 29). A step forward for 10,000 Rohingya refugee children. *Human Rights Watch*. <https://www.hrw.org/news/2020/01/29/step-forward-10000-rohingya-refugee-children>

- Fahmina Karim, M. U. H. (2020). *No education – lost generation: The right to education of stateless Rohingyas in bangladesh*. https://www.inclusive-citizenship.no/wp-content/uploads/2021/02/2021-02-24_Fahmina-Karim.pdf
- Hargrave, K., & Barbelet, V. (2019, December 2). *The Global Compact on Refugees: Lessons from Bangladesh*. ODI: Think Change. <https://odi.org/en/publications/the-global-compact-on-refugees-lessons-from-bangladesh/>
- Jain, A., & Lee, J. (2017). Interviewing Refugee Children: Theory, Policy, and Practice with Traumatized Asylum Seekers Notes. *Yale Journal of Law and Feminism*, 29(2), 421–464. <https://heinonline.org/HOL/P?h=hein.journals/yjfem29&i=427>
- Jakobi, A. P. (2009). Global education policy in the making: International organizations and lifelong learning. *Globalisation, Societies and Education*, 7(4), 473–487. <https://doi.org/10.1080/14767720903412275>
- Karim, A., & Hussain, F. (2019). ‘When Will You Start Teaching the REAL Curriculum?’: Challenges and Innovations in Education for Rohingya Refugees. In P. Nielsen & H. C. Kimaro (Eds.), *Information and Communication Technologies for Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D* (Vol. 551, pp. 675–686). Springer International Publishing. https://doi.org/10.1007/978-3-030-18400-1_55
- Kirk, J., & Winthrop, R. (2007). Promoting Quality Education in Refugee Contexts: Supporting Teacher Development in Northern Ethiopia. *International Review of Education / Internationale Zeitschrift Für Erziehungswissenschaft / Revue Internationale de l’Education*, 53(5/6), 715–723. <https://www.jstor.org/stable/27715426>
- Laugksch, R. C. (2000). Scientific literacy: A conceptual overview. *Science Education*, 84(1), 71–94. [https://doi.org/10.1002/\(SICI\)1098-237X\(200001\)84:1<71::AID-SCE6>3.0.CO;2-C](https://doi.org/10.1002/(SICI)1098-237X(200001)84:1<71::AID-SCE6>3.0.CO;2-C)
- Lee, S. (2013). Education as a Human Right in the 21st Century. *Democracy and Education*, 21(1). <https://democracyeducationjournal.org/home/vol21/iss1/1>
- Maysa Jalbout & Katy Bullard. (2022). *Key tensions in refugee education*. Brookings Institution. https://cdn.givingcompass.org/wp-content/uploads/2022/11/17144540/Key-tensions-in-refugee-education_FINAL-VERSION-1.pdf
- Menashy, F., & Dryden-Peterson, S. (2015). The Global Partnership for Education’s evolving support to fragile and conflict-affected states. *International Journal of Educational Development*, 44, 82–94. <https://doi.org/10.1016/j.ijedudev.2015.07.001>

- Milner, J. (2014). Can Global Refugee Policy Leverage Durable Solutions? Lessons from Tanzania's Naturalization of Burundian Refugees. *Journal of Refugee Studies*, 27(4), 553–573. <https://doi.org/10.1093/jrs/feu023>
- Milton, A. H., Rahman, M., Hussain, S., Jindal, C., Choudhury, S., Akter, S., Ferdousi, S., Mouly, T. A., Hall, J., & Efir, J. T. (2017). Trapped in Statelessness: Rohingya Refugees in Bangladesh. *International Journal of Environmental Research and Public Health*, 14(8), Article 8. <https://doi.org/10.3390/ijerph14080942>
- Pinson, H., & Arnot, M. (2010). Local conceptualizations of the education of asylum-seeking and refugee students: From hostile to holistic models. *International Journal of Inclusive Education*, 14(3), 247–267. <https://doi.org/10.1080/13603110802504523>
- Prodip, M. A. (2017). Health and Educational Status of Rohingya Refugee Children in Bangladesh. *Journal of Population and Social Studies [JPSS]*, 25(2), Article 2. <https://so03.tci-thaijo.org/index.php/jpss/article/view/102280>
- Prodip, M. A., & Garnett, J. (2019). : An Analysis of the Policies, Practices, and Limitations. In *Comparative Perspectives on Refugee Youth Education*. Routledge.
- Prodip, M., & Garnett, J. (2019). *Emergency Education for Rohingya Refugee Children in Bangladesh: An analysis of Policies, Practices and Limitations*. (pp. 191–219). <https://doi.org/10.4324/9780429433719>
- Rahman, M. I., & Missingham, B. (2018). Education in Emergencies: Examining an Alternative Endeavour in Bangladesh. In R. Chowdhury, M. Sarkar, F. Mojumder, & M. M. Roshid (Eds.), *Engaging in Educational Research: Revisiting Policy and Practice in Bangladesh* (pp. 65–87). Springer. https://doi.org/10.1007/978-981-13-0708-9_4
- Reidy, K. (2020, February 10). *Expanding education for Rohingya refugee children in Bangladesh*. Unicef. <https://www.unicef.org/rosa/stories/expanding-education-rohingya-refugee-children-bangladesh>
- Rohingya: Donors Should Require Including Education. (2020, October 22). *Human Rights Watch*. <https://www.hrw.org/news/2020/10/22/rohingya-donors-should-require-including-education>
- Rohingya emergency*. (n.d.). UNHCR. Retrieved December 13, 2022, from <https://www.unhcr.org/rohingya-emergency.html>
- Roth, W.-M., & Barton, A. C. (2004). *Rethinking Scientific Literacy*. Routledge. <https://doi.org/10.4324/9780203463918>
- Roth, W.-M., & Lee, S. (2004). Science education as/for participation in the community. *Science Education*, 88(2), 263–291. <https://doi.org/10.1002/sce.10113>

- Shen, B. S. P. (1975). Science Literacy and the Public Understanding of Science. *Communication of Scientific Information*, 44–52. <https://doi.org/10.1159/000398072>
- Shohel, M. M. C. (2022). Education in emergencies: Challenges of providing education for Rohingya children living in refugee camps in Bangladesh. *Education Inquiry*, 13(1), 104–126. <https://doi.org/10.1080/20004508.2020.1823121>
- Sinclair, M. (2001). *Education in emergencies* (Learning for a Future: Refugee Education in Developing Countries, pp. 1–84). United Nations Publications.
- Srmp, Z. P. C., & Kamal, N. M. (2019). *INEE Minimum Standards for Education: A Brief Overview* (SSRN Scholarly Paper No. 3371229). <https://papers.ssrn.com/abstract=3371229>
- Taylor, S., & Sidhu, R. K. (2012). Supporting refugee students in schools: What constitutes inclusive education? *International Journal of Inclusive Education*, 16(1), 39–56. <https://doi.org/10.1080/13603110903560085>
- United Nations High Commissioner for. (n.d.). *The Rohingya Refugee Crisis and Building Capacity for Rapid and Predictable Humanitarian Response*. UNHCR. Retrieved January 13, 2023, from <https://www.unhcr.org/events/conferences/59e5f4617/rohingya-refugee-crisis-building-capacity-rapid-predictable-humanitarian.html>
- UNHCR. (2020, July 22). A Framework for Refugee Education. Giving Compass. https://givingcompass.org/pdf/a-framework-for-refugeeeducation/?gclid=CjwKCAjwx6WDBhBQEiwA_dp8rXTXyUnTUxo61gsvg91KK50oxnDaJUGVowry-YEaJ311V1UF6yoJ-xoCaMAQAvD_BwE
- UNHCR (2010). *Convention and Protocol Relating to the status of Refugees*. Geneva: UNHCR
- UNHCR (2011e). *UNHCR Global Appeal 2011 Update*. Geneva: UNHCR.
- UNHCR (n.d.). *The 1951 Refugee Convention*. Geneva: UNHCR. <https://www.unhcr.org/en-us/3b66c2aa10>
- UNHCR (2012). *Education Strategy 2010-2012*. Geneva: UNHCR
- Waters, T. , & LeBlanc, K. (2005). Refugees and Education: Mass Public Schooling without a Nation-State. *Comparative Education Review*, 49(2), 129–147. <https://doi.org/10.1086/428102>

Corresponding Author Contact Information:**Author name:** Shukufe Rahman**Department:** Curriculum & Instruction**University, Country:** Indiana University, Bloomington, IN, USA**Email:** shurahma@iu.edu**ORCID:** <https://orcid.org/0000-0002-8040-0797>**Please Cite:** Rahman, S., & Buck, G (2022). Critical Features of Science Education: A Comparison between Global and National Education Policy for Rohingya Refugee Children in Bangladesh. *Journal of Research in Science, Mathematics and Technology Education*, 6(2), 83-98. DOI: <https://doi.org/10.31756/jrsmt.623>**Copyright:** This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.**Publisher's Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.**Data Availability Statement:** The data that support the findings of this study are available on reasonable request from the corresponding author, Shukufe Rahman.**Ethics Statement:** This study does not involve any human/animal participants.**Author Contributions:** All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.*Received: March 01, 2023 ▪ Accepted: May 27, 2023*